

1998

# SIBLING RESEMBLANCE IN HEIGHT, FATNESS AND IQ IS AFFECTED BY SES AND ENVIRONMENT. L.S. Adair. Univ. of North Carolina, School of Public Health, Chapel Hill, NC 27514.

Few studies have examined sibling pairs in developing countries, yet such comparisons may yield important information about gene-environment interactions affecting growth and development. We compared height Z-scores, BMI, skinfolds and IQ scores in 11 year olds and their next youngest sibling (1174 sib pairs with a mean age difference of 28 mo) using data from the ongoing Cebu Longitudinal Health and Nutrition Survey. All correlations were higher in same vs. opposite sex sibs, and among siblings in higher SES households. Among same sex sibs, anthropometry was more highly correlated in boys, but IQ scores were more highly correlated in girls. Index children were relatively taller, heavier, and smarter than their younger sibs in 49.1, 41.9, and 51.2% of pairs, respectively. To identify factors that predict sibling differences, residuals calculated from regressing the index's child size or IQ on the sibling's size or IQ served as independent variables in multivariate linear regression models. The index (older) child was relatively taller when: of lower birth order, both were males, age difference between siblings was small, the mother was taller, and in higher SES households. In contrast, the index child was likely to be relatively fatter when both were girls. SES and maternal education were the strongest predictors of sibling differences in IQ, with sex playing an insignificant role. Older sibs had a higher IQ in higher income households, and when mothers were more highly educated.

## BIOMARKERS OF DIETARY EXPOSURE II (1999-2002)

1999

### COMBINATIONS OF PLASMA PHOSPHOLIPID FATTY ACIDS AS MARKERS OF TOTAL DIET FAT INTAKE. M. Kestin, I. King, Y. Yasui. Fred Hutchinson Cancer Research Center, Seattle WA 98104.

There are, currently, no valid biological markers of total fat intake. Individual PL fatty acids (FA's) correlate poorly with total fat intake, partly because many FA's in the body derive from *de novo* synthesis. Combinations of FA's may be more useful. We tested this hypothesis in 61 post-menopausal women who were randomized to one of two controlled diets for seven weeks: (i) low-fat (18% of Kcal) (n=31) or (ii) moderate fat (36% of Kcal) (n=30). PL FA concentrations were determined by gas-liquid chromatography. Preliminary analyses are presented on the first 52 subjects.

The two groups were comparable at baseline. There were a number of highly significant ( $P < 0.001$ ) changes in relative PL fatty acid concentrations in response to the diets. Using logistic discriminant analysis, a linear combination of C18:1(n-7), C18:2(n-6) and *trans*C18:1 was very effective in distinguishing the dietary group an individual belonged to (area under the Response Operating Characteristic curve,  $\theta = 0.993$ ). The changes in this linear combination over the study also correlated highly with changes in fat intake from baseline ( $r = 0.83$ , 95% CI 0.73, 0.91). In summary, combinations of PL FA's may be useful markers for dietary intervention studies. Supported in part by NIH UO1-CA61712.

2000

### RELATIONSHIP BETWEEN DIET, SERUM AND ADIPOSE ANTIOXIDANTS AFTER MEASUREMENT ERROR ADJUSTMENT. S. Steck, N. Simonson, M. Thamm, and L. Kohlmeier. University of North Carolina at Chapel Hill, Chapel Hill, NC 27599.

We conducted an analysis of habitual dietary intake, serum and adipose levels of  $\beta$ -carotene, lycopene and  $\alpha$ -tocopherol to compare biomarkers of long-term and short-term intake. Data from the EURAMIC study were used to determine the correlation between dietary, serum and adipose antioxidant levels in 23 healthy German women. Dietary intakes of  $\beta$ -carotene, lycopene and  $\alpha$ -tocopherol were measured by a computerized diet history. The amounts of carotenoids consumed in the diet were estimated using the USDA/NCI carotenoid database. Levels of  $\beta$ -carotene, lycopene and vitamin E were measured by HPLC in serum samples and in adipose tissue needle aspiration biopsies. Correlations for  $\beta$ -carotene were 0.32 ( $p = 0.13$ ) for diet and adipose, 0.47 ( $p = 0.02$ ) for diet and serum and 0.79 ( $p = 0.001$ ) for serum and adipose. For lycopene, correlations were 0.05 ( $p = 0.81$ ) for diet and adipose, 0.21 ( $p = 0.33$ ) for diet and serum and 0.55 ( $p = 0.007$ ) for serum and adipose. The correlations for  $\alpha$ -tocopherol were 0.47 ( $p = 0.03$ ) for diet and adipose, 0.22 ( $p = 0.32$ ) for diet and serum and 0.70 ( $p = 0.002$ ) for serum and adipose. After adjustment for measurement error, correlations were 0.77, 0.93 and 1.0 for  $\beta$ -carotene, 0.13, 0.44 and 0.81 for lycopene, and 1.0, 0.43 and 1.0 for  $\alpha$ -tocopherol for diet and adipose, diet and serum, and serum and adipose, respectively. Within-individual to between-individual variance ratios ranged from 0.11 to 0.22 for serum antioxidants, and were up to six-fold higher for adipose, ranging from 0.61 to 1.18. For the carotenoids, diet and serum are more highly correlated than diet and adipose, suggesting that adipose stores are either a longer term indicator or are more influenced by metabolic processes over time than serum. As the estimated measurement errors for these substances are relatively large, deattenuation impacts greatly the conclusions drawn for this comparison.

2002

### RELATION BETWEEN VITAMIN B12 STATUS AND PREVALENCE OF LOW PLASMA B12 IN THE FRAMINGHAM OFFSPRING STUDY. Katherine L. Tucker, Paul F. Jacques, Irwin H. Rosenberg, Sharon Rich, Peter W. Wilson and Jacob Selhub. USDA HNRC, Tufts U, Boston, MA 02111.

Recent reports have shown that vit B12 status is often inadequate among elders. Less is known about younger adults. In this study of Framingham Heart Study offspring, we measured plasma B12 concentrations by radioassay (Biorad Quantaphase II) and vit B12 intake with the Willett food frequency questionnaire. Of 3232 subjects without known CVD or using homocysteine altering drugs, 2999 had both measures. We estimated the prevalence of low B12 status ( $< 250$  pg/ml) by age: 26-49 yrs ( $n = 984$ ), 50-64 ( $n = 1460$ ), 65-83 ( $n = 555$ ), and by use (vs not) of supplements (S) and B12 fortified cereal (C). We regressed low B12 status (Y/N, Proc Logistic, SAS) on B12 intake from S, C and other food, adjusting age, sex, alcohol use, smoking, BMI and energy intake. 16.5% of subjects had low B12 status. Surprisingly there was little difference by age group, from 16.3% (youngest) to 17.1% (eldest). 28% used S, and 45% used C. Prevalence differed by intake source: S users 8.1% vs non-users 19.7%; and among non-S users: C users 15.7% vs non-users 22.9%. Regressions showed no association with any control variable. All 3 intake sources were significant ( $p < 0.01$ ). Odds ratios (OR) of adequate vs low plasma B12 per  $\mu$ g difference in vit B12 intake were greatest for cereal (C, OR = 1.23; S, 1.08; other food 1.07). These results suggest that low B12 status may be common among younger as well as older adults and that supplements or fortified cereal may be protective.

2001

### Blood and urinary antioxidant biomarkers of fruit and vegetable intake among Chinese tin miners. MR Forman, Zheng J. Gross M. Yao S-X, Graubard BI, Qiao Y-L, Taylor P, Keith S. National Cancer Inst, Bethesda, MD 20892, Univ of Minnesota, Minneapolis, MN 55455, Labor Protection Institute, Gejiu, China, Information Management Services, Silver Spring, MD. This research examined the seasonal relationship between fruit and vegetable intake and blood antioxidant and urinary flavonoid levels among Chinese tin miners at high risk of lung cancer. Seven days of food recalls, a 24-h urine on recall day 6, and a fasting blood draw on recall day 7 were collected each season of 4 seasons in 1995-6. Spearman Rank Correlation Coefficients between diet and antioxidant levels were computed, with significant results described at a $P$ value of $\leq 0.05$ . Whereas mean fruit intake peaked in the spring ( $\bar{x} = 105$ g/d), declined from summer to fall, and was lowest in winter ( $\bar{x} = 61$ g/d), vegetable intake was the lowest in spring ( $\bar{x} = 264$ g/d), peaked in summer ( $\bar{x} = 296$ g/d), and declined thereafter. Mean daily fruit intake in spring was correlated with plasma $\alpha$ -carotene ( $r = 0.30$ ) and urinary flavonoid levels ( $r = 0.32$ ); intake in summer was correlated with plasma $\beta$ -carotene ( $r = 0.41$ ) and red blood cell (RBC) folate levels ( $r = 0.67$ ); and intake in winter was correlated with plasma $\alpha$ -carotene levels ( $r = 0.57$ ). In contrast, vegetable intake in fall was correlated with plasma $\alpha$ - and $\beta$ -carotene ( $r = 0.51$ ; $r = 0.52$ ), lutein ( $r = 0.45$ ), Vitamin C ( $r = 0.61$ ), and RBC folate levels ( $r = 0.40$ ). Therefore blood and urinary antioxidant concentrations were biomarkers of the seasonal variation in fruit and vegetable intake in a culture with a diet of mixed dishes that provided a low average daily intake of fruit and vegetables.